

**REMARKS/ARGUMENTS**

Reconsideration and allowance of this application are respectfully requested.

Currently, claims 1-27 are pending in this application.

**Allowable Subject Matter:**

Claims 3-4, 8-9 and 13 were objected to as being dependent upon a rejected base claim. However, the Office Action held that these claims would be allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims. By this Amendment, claims 3 and 8 have been rewritten in independent form. Claims 4 and 9 depend from now independent claims 3 and 8, respectively. Claim 13 has been maintained.

**Rejections Under 35 U.S.C. §103:**

Claims 1, 5-6 and 10-12 were rejected under 35 U.S.C. §103 as allegedly being unpatentable over Wakamoto (U.S. '203) in view of Hasegawa et al (U.S. '514, hereinafter "Hasegawa"). Applicant respectfully traverses this rejection.

In order to establish a *prima facie* case of obviousness, all of the claim limitations must be taught or suggested by the prior art. The combination of Wakamoto and Hasegawa fails to teach or suggest all of the claim limitations. For example, the combination fails to teach or suggest "calculating estimated central temperature of the exhaust gas after-treatment device from an output of the outlet gas temperature sensing means with the use of an inverse function of a change in the outlet gas temperature with respect to a change in the temperature of the exhaust gas after-treatment device," as required by independent claim 1. The combination also fails to teach or suggest "determining whether the exhaust gas after-treatment device is in a predetermined state,

based on the estimated central temperature calculated by the temperature estimating means,” as further required by independent claim 1 and its dependents. The combination also fails to teach or suggest calculating first estimated central temperature of an exhaust gas after-treatment device from an output of an inlet gas temperature sensor with use of a transfer function of a change in the temperature of the exhaust gas after-treatment device with respect to a change in the inlet gas temperature, and second estimated central temperature of the exhaust gas after-treatment device from an output of the outlet gas temperature sensor with the use of an inverse transfer function of a change in the outlet gas temperature with respect to the change in the temperature of the exhaust gas after-treatment device, as required by independent claim 6 and its dependents. The combination further fails to teach or suggest determining whether the exhaust gas after-treatment device is in a predetermined state based on the first estimated central temperature and the second estimated central temperature, as required by independent claim 6.

In contrast to the above noted limitations, Wakamoto merely describes obtaining a temperature difference  $T_a$  between an upstream temperature  $T_{aa}$  and a downstream temperature  $T_{bb}$  (see col. 8, lines 51-65 and steps 41-43 of Fig. 5), and judging deterioration of a catalyst based on the temperature difference (see col. 9, lines 18-32 and steps 47-49 of Fig. 5). Nothing is taught in Wakamoto regarding estimating a central temperature of an exhaust gas after-treatment device from an output of an outlet gas temperature sensing means with the use of an inverse transfer function of a change in the outlet gas temperature with respect to a change in the temperature of the exhaust gas after-treatment device. Indeed, page 3 of the Office Action explicitly admits “Wakamoto

fails to specifically discuss the use of an inverse transfer function to estimate the temperature of the exhaust gas after-treatment device.”

Applicant respectfully submits that Hasegawa fails to remedy the admitted deficiency of Wakamoto with respect to the presently claimed invention . In particular, col. 5, lines 40-50 (specifically identified by the Office Action) of Hasegawa states, *inter alia*, the following:

“Specifically, use of the Z transformation to express Equation 2 as a transfer function gives Equation 5, and a real-time estimate of the air/fuel ratio input in the preceding cycle can be obtained by multiplying the sensor output LAF of the current cycle by the inverse transfer function. FIG. 5 is a block diagram of the real-time air/fuel ratio estimator.”

The above noted portion of Hasegawa merely discloses estimating an air/fuel ratio using an inverse function. This portion of Hasegawa (and all other portions) do not teach or suggest estimating central temperature of an exhaust gas after-treatment device from a sensed outlet gas temperature and an inverse transfer function of a change in the outlet gas temperature with respect to a change in the temperature of the exhaust gas after-treatment device. Accordingly, even if Wakamoto and Hasegawa were combined as proposed by the Office Action, the combination would not have taught or suggested all of the claim limitations.

Accordingly, Applicant respectfully requests that the rejection of claims 1, 5-6 and 10-12 under 35 U.S.C. §103 in view of Wakamoto and Hasegawa be withdrawn.

Claims 2 and 7 were rejected under 35 U.S.C. §103 as allegedly being unpatentable over Hasegawa and further in view of Kawai et al (U.S. ‘489, hereinafter “Kawai”). Applicant respectfully traverses this rejection.

As noted above, the Office Action admits that “Wakamoto fails to specifically discuss the use of an inverse transfer function to estimate the temperature of the exhaust gas after-treatment device.” Kawai fails to remedy this admitted deficiency of Hasegawa with respect to the presently claimed invention. Indeed, the Office Action does not even allege that Kawai teaches or suggests an inverse function to estimate the central temperature of an exhaust gas after-treatment device. Instead, section 12 of the Office Action merely alleges that “Kawai discloses an air-fuel ratio control system for an internal combustion engine that uses a transfer function expressed with dead time and first-order lag to estimate an engine operating parameter (Fig. 2; Col. 2, Lines 8-18).” Nothing in Kawai teaches or suggests estimating central temperature of an exhaust gas after-treatment device using an inverse transfer function as claimed.

Accordingly, Applicant respectfully requests that the rejection of claims 2 and 7 under 35 U.S.C. §103 over Hasegawa and Kawai be withdrawn.

Claim 12 was rejected under 35 U.S.C. §103 as allegedly being unpatentable over Hasegawa and further in view of Wada (U.S. ‘494). Applicant respectfully traverses this rejection. Again, Wada fails to remedy the admitted deficiency of Hasegawa with respect to the presently claimed invention. Indeed, there is no allegation in the Office Action that Wada even teaches or suggests estimating central temperature using an inverse transfer function as claimed. Instead, section 14 (pages 6-7) of the Office Action merely states that “Wada discloses a catalyst deterioration detecting apparatus for an internal combustion engine that determines a predetermined value for use in catalyst deterioration detection based on engine operating conditions (Abstract).”

Accordingly, Applicant respectfully requests that the rejection of claim 12 under 35 U.S.C. §103 over Hasegawa and Wada be withdrawn.

**New Claims:**

New claims 15-27 have been added to provide additional protection for the invention. New independent claim 15 requires, *inter alia*, "calculating an estimated central temperature of the exhaust gas after-treatment device based on the sensed outlet gas temperature and an inverse transfer function of a change in the outlet gas temperature with respect to a change in the temperature of the exhaust gas after-treatment device."

New independent claim 20 requires, *inter alia*, "calculating a second estimated central temperature of the exhaust gas after-treatment device based on the outlet gas temperature sensor and an inverse transfer function of a change in the outlet gas temperature with respect to the change in the temperature of the exhaust gas after-treatment device."

Accordingly, Applicant respectfully submits that new claims 15-27 are allowable.

**Conclusion:**

Applicant believes that this entire application is in condition for allowance and respectfully requests a notice to this effect. If the Examiner has any questions or believes that an interview would further prosecution of this application, the Examiner is invited to telephone the undersigned.

Respectfully submitted,

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